Author: Arianna Imperiali

Title: Settling the Magnetic Field Strength Debate in OMC-1

Research Summary:

Guerra et al. (2021) and Hwang et al. (2021) both present different magnetic field values for OMC-1, a region in the Orion Molecular Cloud. This paper uses the data used by Guerra et al. (2021) and the methodology used by Hwang to present another analysis and the magnetic field strength. From these data, the author created maps of the OMC-1 region to determine the angular polarization dispersion. The values of velocity dispersion and observables needed to calculate the cloud volume density were taken from literature. These values were all used to calculate the magnetic field strength in different sections of OMC-1 at different wavelengths and different kernel sizes. There were large discrepancies between the results found in this study and those presented by Guerra et al. (2021). This indicates that the methods used by Hwang et al. (2021) produce different results than the methods used by Guerra et al. (2021).

Recommendation: Accept with minor revision

The methodology of the paper seems sound and is presented in detail. However, some more explanations and clarifications should be given.

Concerns:

Major points:

- The telescopes and collaborations referenced (SOFIA, HAWC+, SCUBA-2, BISTRO, HARP) need citations from papers.
- Future work and a conclusion are needed in order to thoroughly summarize the work presented and demonstrate the merit of the paper.

Minor points:

- Paper should be in AAS format.
- Table captions need much more description. It might also be worth combining the tables into one or two large tables to consolidate results.

Abstract:

- Final values should be stated in introduction, or at least, the most prominent results.

Introduction:

- More explanation is needed about the DCF method.
- In paragraph 2, "The distortion of magnetic field lines by turbulence is reflected into the dispersion of the polarization angles." Is this the polarization of dust grains, or of light?
- Was Figure 1 from a source (in which case it needs to be cited) or was it created by the author.

- Better resolution is needed on Figure 1. When zooming in, it becomes pixelated.
- "Chuss et al. (2019) combined these observations with photometry…" Was this photometry additional data from HAWC+?
- Explanation is needed on what a two-point structure function is.
- It should be made clear at the end of the introduction that the analysis presented uses the data from Chuss et al. (2019) but the methods from Hwang et al. (2021).
- Is there a reason why the HAWC+/SOFIA data were used and not the SCUBA-2 data?

Observations:

- If only HAWC+ data are presented, then the 2.1 subsection title can be deleted.
- It should be explained what Stokes I, Q, and U are and what the chop-nod-dither observing method is.

Methodology:

- It might be best to combine Figures 1, 2, and 3 in to one figure with multiple subfigures to demonstrate the angle deviations and how they arose.
- Why does each region in OMC-1 have a distinct B? I.e., why would they each have different angle dispersions?
- "We must utilize the number of turbulent cells in a gas column" Is this gas column a general volume of gas (ρ)? It is unclear exactly what this is.
- "The product of σ_φ and N, which are the values of σ_φ" the author should be clear that they are redefining σ_φ.
- Is the measured column density in equation 4 ρ or $N(H_2)$?
- "It is important to note that the values for σ_φ and B of the Orion Bar for the 154 mm and the 214 mm wavelength bands are not present in any table." This should be mentioned a lot earlier, like when the first table is referenced.

Discussion:

- The first sentence should be moved to the intro and emphasized as the purpose of this research.
- In the second sentence and in Tables 5 and 6, is the reference to Chuss et al. (2019) supposed to be Guerra et a. (2021)?
- Another table should be made to present the results from Hwang et al. (2021) as well.
- What is a turbulent-to-ordered magnetic energy ratio?
- Does future analysis involve using data from Hwang with the methods from Guerra?
- Can the author claim that there is a "significant difference" in the results quantitatively? If not, this should be reworded, that there is a substantial difference. The word "significance" implies statistical methods to confirm this.

Evaluation of Criteria:

Is the length appropriate?

The author needs to add more explanation, so the paper should be longer.

Are the title and abstract sufficiently informative?

The title should be changed because this paper does not completely settle the debate, but only analyzes one component contributing to the discrepancy. The abstract is sufficiently informative.

Is the contribution to science significant?

Yes, this paper addresses a discrepancy in the scientific community about the magnetic field measurements in OMC-1 and offers an in-depth analysis of one of the components contributing to the debate.

Is level of English adequate?

Yes, the level of English is adequate.

Is the literature properly cited?

There are some places where more literature should be cited, specifically, when referencing telescopes (such as HAWC+ and SCUBA-2).

Are the results clearly and accurately presented?

The tables might need to be rearranged to present all the data together to facilitate comparisons for the reader. Also, the results need to be reported with uncertainties.

Is the topic appropriate for the journal?

Yes, this is appropriate for the journal.

Data Management Plan:

The results are all presented in tables, and the methodology is thoroughly explained, so these results are reproducible. However, all the images should be shown as well to help corroborate results in future studies.

Additional Comment: I think that this paper is very strong and presents a good analysis. Good job, and good luck!

Peer review report

Title: Settling the Magnetic Field Strength Debate in OMC-1

Author: Arianna Imperiali

Summary

The study examines why the two groups Guerra et al (2021) and Hwang et al. (2021) calculate two very different values for the magnetic field strength of the Orion Molecular Cloud 1 (OMC-1). Specifically, the former found the magnetic field to be from a few hundred µG to 2 mG, while the latter found it to be from 0.8 to 24.6 mG. The author applied the Hwang et al. (2021)'s method to Guerra et al. (2021)'s data to analyze whether the different method results in the large difference between two calculated magnetic field strength. The photometry and polarimetry data comes from the High-resolution Airborne Wideband Camera (HAWC+) in four bands 53, 89, 154, and 214 µm. Regarding the methodology, the author uses 3x3, 5x5, and 7x7 pixel boxcar filters to produce a smoothed map depicting the non-distorted magnetic field directions. The smoothed map is subtracted from the observed map to have a residual angular position map. From the residual map, the author calculates σ_θ - the standard deviation of the angular differences throughout the map for each kernel size for each of the four wavelengths. Also, because each region in the OMC-1 may have a distinct magnetic field, the author apply object masks to calculate the angular polarization for different regions in the OMC-1. Using the σ_θ, the magnetic field strength can be determined. The study's result demonstrates an inconsistency between the obtained $\sigma_\theta \times N$ (N is the number of turbulent cells in the gas column) and the comparable σ_θ value from Chuss et al. (2019). The author concludes that this inconsistency suggests a significant difference between the two analysis methods. However, she also emphasizes that additional analysis to examine the data, the volume density component, and the velocity dispersion component is needed.

Recommendation: accepted with major revisions.

Justification

    a. **Major points**
- Introduction:
  - ➤ Figure 1: a higher resolution for this plot is needed. Also, the author needs to explain how the borders of the three regions are determined. Or if this is a picture from literature, a citation is needed.
- Discussion:
  - ➤ *"However, in order to gauge … additional analysis is needed."*: with only the conclusion of the different angular polarization, the author does not have a very strong evidence to explain why the two magnetic field strengths are different or which one is correct (as she stated, analysis on the data and other aspects is necessary). Therefore, the question addressed in the paper is not really answered.

b. Minor points

- General paper:
  - ➢ Instead of using "Eq.", I think the author should write fully as "Equation".

- Introduction
  - ➢ *"Recently, two different authors …"*: I would suggest "two different groups" or "two different papers" here. The two papers were not done only by 2 people.

- Observation
  - ➢ *"… CRUSH V2.4.2ALPHA1 …"*: need citation for this method.
  - ➢ *"More specifically, they used the "bright" keyword …"*: the author should give more explanation on what the "bright" keyword is.
  - ➢ *"Polarized light is represented by the Stokes parameters, I, Q, and U."*: the author should explain or define what those parameters are.
  - ➢ *"These observations were done using the standard chop-nod-dither observing method."*: the author should give more explanation to what this method is rather than just pointing out to the reference.
  - ➢ *"They reduced the data using the V1.3.0-BETA3 …"*: What are the differences between this reduction method and the CRUSH V2.4.2ALPHA1? Why did they use the different reduction method for this additional polarimetry data. Moreover, what are the differences between the additional data and the initial data?

- Methodology
  - ➢ It is a bit hard to follow the methodology section. The author should state the goal of the methodology in the beginning of the section. For example, the first sentence of the Discussion section ("The purpose of completing this analysis … for the OMC-1 region") should be put in the methodology section.
  - ➢ *"… the turbulent-to-ordered magnetic energy ration $\frac{B_t^2}{B_0^2}$."*: the author should explains what B_t^2 and B_0^2 are.
  - ➢ The order of the tables should be re-arranged. Particularly, in the text, Table 6 is mentioned before Table 4 and 5.

- Discusison
  - ➢ *"When it comes to the unknown of … of Science Fiction."*: I think this sentence distracts from the discussion about the need of the First Contact Protocol. Also, the term "limitless possibilities" in the following sentence should be enough to convey the idea of this sentence.
  - ➢ *"Despite their detailed laws, it is still difficult to enforce..."*: the author should explain why it is difficult, or what prevents the laws from being agreed among nations.

Evaluation

The length of the paper is appropriate and the topic is appropriate for the journal. The title and the abstract convey the content of the study. The contribution to science is significant, as the study helps determine the correct value between the two contrasting ones. The paper has a good potential, however, more work needs to be done to sufficiently settle the debate. Even though I give the paper the recommendation of "accepted with major revision", this does not mean the methodology of the paper is wrong. Rather, it means more work in the methodology should be done, and the author seems to acknowledge that. The English in the paper is easy to follow, however, there are some jargons that need clearer explanations. Also, some citations are missing in the paper. The result is well stated. Regarding the Data Management plan, the author uses the data provided by another papers, and those data were already published.

All my comments are constructive reviews and sometimes they can come from personal preference or personal experience. Please understand if I misunderstand the author in some points. Also, please send my congratulation on the author's work and I enjoy reading the paper. Good luck on continuing working on the paper.

Author: Arianna Imperiali

Title: Settling the Magnetic Field Strength Debate in OMC-1

Summary:

Two previous studies (Guerra et al. (2021) and Hwang et al. (2021)) have analyzed the magnetic field strength in OMC-1 but reported vastly different results. The goal of this study is to analyze the methods employed by Guerra et al and Hwang et al to determine the reason behind this conflict of results. Photometry and polarimetry for OMC-1 were obtained from SOFIA using HAWC+. First, the angular polarization dispersion needed to be calculated. To complete this, a method analogous to unsharp masking was used. 3x3, 5x5 and 7x7 pixel boxcar filters were moved around to perform convolutions on the Stokes U and Q maps. The mean polarization angle of each box is computed and recorded. Then a residual map is created by subtracting the smoothed map (using the mean measurements from the moving box) from the original map. With this residual map, the angular polarization dispersion is the standard deviation of the angular differences throughout the map for each kernel size. Finally, the number of turbulent gas cells must be accounted for by multiplying the number of cells by the calculated angular polarization dispersion. Next, the calculations used for volume density and velocity dispersion are discussed and the resulting magnetic field strength for each kernel size and wavelength are displayed. The study is not completed, but the correct kernel size must be determined. Once this is done, the results can be analyzed and the difference in angular polarization dispersion for the two previous studies can be analyzed.

Rating: Accept with Major Revision

Minor Revisions:

- The abstract is too in depth. The background material should be saved for the introduction. The abstract should be used to present the goals and results of the study

- In the Introduction, there should be a more in-depth explanation of the DCF method. This method seems critical to magnetic field studies and a full explanation should be given

- In the introduction, the sentence beginning "Maps of magnetic field strength distributions …" , is the parameter ρ a volume mass density? It should be mentioned what type of density this is.

- In the introduction (page 3), there are two paragraphs detailing observations and methods used by the previous two studies. These should not be mentioned in the introduction and saved for a later section detailing the two studies of interest (see comment in Major Revisions for more on discussing the previous studies).

- At the end of section 3, it is mentioned how no values for the Orion Bar are listed for 154 μm or 214 μm. This should be moved to the beginning of this section, so the reader does not have to wait for a reason why certain values are omitted.

- Subsections would make section 3 easier to parse. Section 3 seems to be broken into two main parts, the angular polarization dispersion calculations and the mass density and velocity dispersion determination. Separating these two into subsections would be beneficial to the reader

Major Revisions:

- A citation needs to be given for Figure 1. If this figure was created by this study, then this must be mentioned.

- There needs to be a clear, in depth overview of the methods implemented by the two other studies. The procedures used by them are described throughout the paper and are hard to follow. It would be beneficial to the reader if a new section was added detailing the methods and calculations used by Guerra et al and Hwang et al. The author could then clearly explain the differences between the two studies which would help the reader better understand the goals of this project.

- In section 3, there needs to be an explanation as to how previous studies determined parameters such as the number of turbulent cells, the velocity dispersion, the average column density of molecular hydrogen, the uniform cloud depth and the mean molecular weight, all these values are obtained from previous studies with no mention of how they were calculated.

- It is not clear why the author is using these methods. Is the author implementing the methods used in the Hwang et al. paper on the data from the Guerra et al. paper? It is very unclear how using the boxcar method on the data will be able to determine the reason the studies report vastly different magnetic field strengths. I think part of this confusion is due to the fact that the methods employed by the previous studies are not well explained (as stated above). It needs to be clear to the reader how the methods employed will demonstrate the goals of the project.

- Overall, the project is not finished. The correct kernel size needs to be determined (and a reason behind which size was picked needs to be given). After this, the author can determine if the difference in methods used to compute the angular polarization dispersion is the cause of the difference in magnetic field strength.

- A conclusion needs to be added to summarize the goals and results of the study.

Evaluation of Criteria:

Is the length appropriate?

- There are sections that should be added to the paper, including a section giving a full description of the two previous studies and a conclusion to summarize the results.

Are the title and abstract sufficiently informative?

- The title is good. The abstract is overly informative, the background material can be left to the introduction

Is the contribution to science significant?

- Yes, this paper resolves a current debate in the area of magnetic field studies

Is the level of English adequate?

- Yes

Is the literature properly cited?

- Yes, the background and introduction are rooted in literature. The only issue is the lack of a citation for Figure 1, as stated before.

Is the topic appropriate for this journal?

- Yes

Data Management Plan?

- The results are clearly displayed in tables. After the study is finished and the final results are obtained, it would be beneficial to add another table displaying the magnetic field strengths determined in this study and the other two studies for a direct comparison

Additional Comments:

- This study is very interesting. I would like to thank the author for all their hard work in completing this study. This project has the prospect to resolve a major conflict in this field of astronomy.

Note to the Editor – Arianna

To the Editor-

While I stand by my review of this paper, I still wish to remain anonymous to the author should my identity be requested. I found significant issues with this paper. I would have liked to see a better and more digestible explanation of the author's methodology. While the overall intent of the research is clear, the specifics are rather muddled in scientific jargon and this made the research very difficult to understand. Despite this, I would still recommend the publication of this paper due to its importance in its field. The results do suggest that there may be issues with methodology when calculating largescale magnetic fields in the Galaxy, therefore, the implications of this research are very important. If these methodologies can be fixed, then the better future research will be for it!

Best regards,

Danielle Mortensen

Arianna Review

Summary:

The author attempts to resolve a discrepancy over the magnetic field strength in the Orion Molecular Cloud 1 (OMC-1), as determined by two separate groups, Hwang et al. and Guerra et al., both released in 2021. Hwang et al. determined the magnetic field to be somewhere between a few hundred microGauss and 2 mG while Guerra et al. determined it to be between 0.8 mG and 24.6 mG. The author analyzes the use of the Davis-Chandrasekhar-Fermi (DCF) method by both groups to estimate these numbers and determine where the difference occurred. Specifically, the analysis focused on the angular polarization dispersion component of the DCF method. By recalculating the results of Hwang et al. using unsharp masking methods split between key areas of OMC-1 and adding in components of beam and line-of-sight integration, the author calculates the differences in the angular polarization dispersion components. These differences show that it was the DCF method analysis which created the differences that are evident between the two groups.

Recommendation:

I would recommend that this paper be **accepted with major modifications**.

Justification:

- *Major Points:*
  - Author does not explain their portion of the research in layman terms
    - Methodology section was particularly difficult to follow.
    - Was this simply a recalculation of the Hwang et al. results and comparison to Guerra et al.?
    - Simply put, what were the differences between what the author did and what Hwang et al. and Guerra et al. did?
- *Minor Points:*
  - Abstract: "…ranging from a few hundred microGauss to up to 2 mG…vary from 0.8 to 24.6 mG."
    - When comparing results from the two papers in question, it may be helpful for the author to use the same units. This would give the reader a better idea of how much a discrepancy there is without needed to do unit transfers.
  - Introduction: "…they applied a two-point structure function to the polarimetry data at each wavelength measurement within a small circular sub-region at each pixel."
    - Two-point structure functions are introduced but never explained.
  - Introduction: "They used the C18O spectral line profiles from HARP to measure the velocity dispersion."
    - Author does not explain how velocity dispersions are obtained from these spectral lines.

- o Introduction: "Finally, a discussion of the results and implications are presented in Section 5."
  - A review of Section 4 is not explicitly present here.
- o Observations: "…raster scans of the region in all four bands observed…"
  - It is unclear what raster scans are and what their purpose is in regard to this research.
- o Observations: "…using CRUSH V2.4.2ALPHA1 with non-default options. More specifically…"
  - The paper would benefit from an explanation of what "CRUSH V2.4.2ALPHA1" is.
  - It is also unclear what "clipping" the data means and how it would affect the analysis.
- o Observations: "Because of the relatively small fractional bandwidth of the filters…"
  - It would be helpful for the author to define the variables lambda and delta lambda. It is commonly understood to be wavelength and the change in wavelength, but it is not clarified whether or not this is the case.
  - Additionally, what are color corrections, and how would they have affected the data?
- o Observations: "The chop throw ranged between 76 and 80, and the chop/nod angled was 125 deg…"
  - What is this chop-nod-dither method? What is the significance of these numbers?
- o Methodology: "We use 3x3, 5x5, and 7x7 pixel boxcar filters in the *convolve2d* funtion from Python's *SciPy* library…"
  - It would have been helpful to have a translation of this long and jargon-heavy sentence into layman terms.
- o Methodology: "…it is also important to consider the beam and line-of-sight integration that Chuss et al (2019)…"
  - Was this a method which Hwang et al. did not use?
  - If so, was this the exact point of discrepancy between the two results?
  - Without the *N* values, do the results align with Hwang et al.?

Evaluation:

- - *Is the paper length appropriate?*
  - o Perhaps the author would benefit from including more detailed descriptions of the difficult terms and variables which are integral in their research. This may result in a longer paper, however, it may be easier to follow than at its current state.
- - *Are the title and abstract sufficiently informative?*
  - o Yes. The title and abstract are accurate descriptions of work and clearly outline both the problem and the findings of the research.
- - *Is the contribution to science significant?*

- o Yes. If these results are able to show that certain methodologies in magnetic field analysis are flawed, then it will have a great impact on astrophysics!
- *Is the level of English adequate?*
  - o No. The paper has a fair bit of jargon and difficult-to-read sections. If each of the complex terms and phrases (for example "raster scans", "velocity dispersion of the gas coupled to the magnetic field", "angular polarization of magnetic field vectors", "magnetic pressure", "diffraction-limited beam", etc…) had been fully explained to the reader, then it would have allowed for the research to be more accessible to those not directly involved in the field of study.
- *Is the work properly grounded in literature?*
  - o Yes. Importantly, there is relatively even addressing of both sides of the issue (Hwang and Guerra). The author does a good job of not objectively favorite any one of the sides.
- *Are the results clearly and accurately presented?*
  - o Yes. Table 7 is particularly evident to suggest that the methodologies used by certain parties in calculating the magnetic field were flawed.
- *Is the topic appropriate for the Journal?*
  - o Yes. The author's research is a clear fit for this Journal being on the topic of largescale magnetic field analysis.
- *Is the data management plan good?*
  - o No. The author makes no mention of their release or intent to release any of the data or software.

Final Comments:

I am impressed by the author's willingness to tackle such a difficult issue! The implications of this paper are key to the successful analysis of largescale magnetic fields in the future, and this happily takes us one step closer to addressing a major concern of methodology in this field. I hope these comments are accepted as constructive criticisms and the author finds them helpful. My best wishes in their success!

Summary:

This paper describes a process of analyzing the conflicting results of two different studies (Guerra et al. and Hwang et al.) regarding the magnetic field strength in the Orion Molecular Cloud 1. Data was collected by Chuss et al. using HAWC+ onboard SOFIA. For this paper, the data from Chuss was run through the analysis process from Hwang to calculate angular polarization dispersion. To accomplish this, the images from HAWC+ were smoothed using 3 different kernel sizes (3x3, 5x5, and 7x7 pixels). The mean polarization angle is calculated from the smoothed image using the Stokes parameters. The residuals between the initial image and the smoothed image are used to calculate the standard deviation of the angular differences. This value is used to obtain the magnetic field strength. The turbulent-to-ordered magnetic energy ratio is also determined from this value. The paper concludes by acknowledging that there is a significant difference in the analysis methods, but additional analysis is needed.

Recommendation:

Accept with minor revision

Points of Consideration:

Major:

Paper did not initially mention analysis was only on HAWC+ data from Chuss using Hwang's method. The abstract and the introduction imply a 2-way analysis between Hwang and Guerra

Stokes parameters neither described nor cited

Table descriptions vague. More explanation of what is tabulated would provide much clarity

Observations section does not mention data used by Hwang

Paper claims to compare Hwang and Guerra yet comparison is more often than not between Chuss and Hwang

Minor:

§1 ¶1 last line is difficult to understand

Colors of words on Fig 1 hard to read (blue/black on blue)

Section 4 not mentioned in summary at end of intro

§3 can use more detail on what is being done with the filters

Unclear how values of σ_φ X N result in values presented in Table 3

Table 4 is described well after the equation which it references

Tables 5 and 6 located in §3 but not referenced until §4

Description of turbulent-to-ordered magnetic energy ratio vague

Unsharp masking method unclear. A better description would help

Calculations of magnetic energy ratio being carried out in discussion section rather than methodology section with other calculations

Paper very technically written and hard to understand without more inside/background knowledge

Paper would benefit from an additional proofread

Evaluation:

Length:

Length is appropriate. More description on points mentioned above would add length which is no issue

Title and Abstract Sufficiency:

Abstract implies a 2-way analysis between Guerra and Hwang yet the paper seems focused on an analysis of Chuss's data through Hwang's analysis

Contribution to Science:

Paper provides a much-needed analysis on the discrepancy between two results in magnetic field measurements of OMC-1

Level of English:

Paper is easy to read, and language used is understandable

Literary Citations:

In general, credit is given where due. Stokes parameters are not cited

Clarity and Accuracy of Presentation:

Results and process are worked out step by step albeit in a complicated, technical fashion

Topic Appropriate for Journal:

The topic of this paper is appropriate for this Journal

Data Management Plan:

No comment is made on the availability of the data nor on the code used to perform the analysis steps

Additional Comments:

This paper is fairly well written. Some clarity is needed in points mentioned above as well as general restructuring of table placement and the possible reordering of the presentation of information and calculations. In the hope that the author accepts these comments, I accept the author's work and compliment them on their hard work and results.

Title: Settling the Magnetic Field Strength Debate in OMC-1

Author: Arianna Imperiali

Summary: The author begins the paper by introducing magnetic fields in the diffuse interstellar medium and molecular clouds. She describes techniques that measure the dispersion of magnetic field vectors in turbulent molecular clouds, which builds upon the methods used to determine magnetic field strength distributions. For this study, she focuses specifically on the Orion Molecular Cloud (OMC) to investigate the order-of-magnitude difference between the magnetic field strength found by Guerra et al. (2021) and Hwang et al. (2021). She obtains photometry, polarimetry, and Stokes parameter data of OMC-1 from Chuss et al. (2019) with the HAWC+ at the Stratospheric Observatory for Infrared Astronomy. She performs convolutions on the Stokes maps to create a smoothed showing the non-distorted magnetic field direction and calculates the mean polarization angle of the smoothed map. She subtracts then analyzes the residual map that results from comparing the smoothed map to the observed map to obtain the standard deviations from convolutions of various kernel sizes applied to four wavelengths. The results of the study yield the magnetic field strength values per region in each wavelength for each kernel size. The author concludes that there exists a difference in the analysis methods of the previous studies for the angular polarization component of the DCF method, which indicates the need for future studies to check for other contributions to the differences in previous results.

Recommendation: Accept after minor revisions.

Justification of Recommendation:

Major points:

- Some concepts and steps in the methods of the paper need more explanation when the author first introduces them. These instances include:
    o Stokes parameters (section 2.1)
    o The reasons for checking the data, the volume density component, or the velocity dispersion component in future studies (last sentence of section 4)
- The purpose for research stated at the end of the introduction sets up the paper as though the author plans to investigate various components of the previous studies until finding the

cause of the difference between past results. This contrasts with the first claim in the discussion stating that the purpose was to determine if a single component (σ_φ) of the previous studies caused the difference. This needs to be specified in the introduction for the procedures to match the purpose of research.

Minor points:

- The author mentions the Davis-Chandrasekhar-Fermi method without an explanation of what the method entails or in what ways it was developed upon for the methods of Hildebrand et al.
- The last paragraph of the introduction section references an order-of-magnitude difference in results between Guerra et al. (2021) and Hwang et al. (2021). The author should specify here the results that are an order of magnitude different.
- Section 3 references the importance of the beam and line-of-sight integration from Chuss et al. It is not obvious to the ready the reasons why these integrations might be important to this study.
- The paper does not have a conclusions section.
- Although not always necessary, the tables without captions are difficult to follow, especially when they are not right above/below the section referencing them.

Evaluation:

1. Is the length appropriate?
    a. Yes – the length of the paper overall is appropriate, but the introduction is long.
2. Are the title and abstract sufficiently informative?
    a. Yes – both the title and abstract are sufficiently informative.
3. Is the contribution to science significant?
    a. Yes – the project addresses conflicting results from previous study.
4. Is the level of English adequate?
    a. Yes – the level of English is adequate.
5. Is the literature properly cited?
    a. Yes – the author sufficiently cites necessary resources.

6. Are the results clearly and accurately presently?

    a. Yes – the results are presented clearly and accurately.

7. Is the topic appropriate for this journal?

    a. Yes – the topic is appropriate for this journal.

8. Data management plan?

    a. The author indicates plans to continue with this work to provide reliable results from the study.

<u>Additional Comments:</u> Kudos to the author for tackling a complicated study in such a short time frame. Her hard work and success in the first part of this project is promising for the next steps.